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# Weighted hardy inequalities with sharp constants

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## Abstract

Using the Bessel functions we obtain several weighted Hardy inequalities with sharp constants. The following inequality for absolutely continuous functions is a simple example: If p and ν are positive numbers, and f: [0, 1] → ℝ satisfies the conditions f(0) = 0 and x1/2-p/2f′ ∈ L2(0, 1), then, where Fν (x) = √xJν(jν-1x1/(2ν)), Jν is the Bessel function of order ν and jν-1 is the first positive zero of Jν-1. In the general case we have to introduce constants z = λν(2/q) as the first positive root of the Lamb equation Jν(z) + qzJ′ν (z) = 0 and the functions z = z(q) that may be found as the solution of the initial values problem. © 2010 Pleiades Publishing, Ltd.

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## Keywords

Bessel function, Hardy inequality, Lamb constant